Integrated Ocean and Coastal Mapping

Data Supporting
Science
and Sound
Decision-Making

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October 27, 2014

What is IOCM?

IOCM is *planning, acquiring, integrating, and managing* ocean and coastal geospatial data and derivative products for easy access and use by the greatest range of users (federal, state, academia, etc.)

<u>Three primary tasks:</u>

1. **Data Acquisition**
2. **End-to-End Data Management**
3. **Maximum Use and Re-Use of data**

Definition

The term "ocean and coastal mapping" means the acquisition, processing, and management of physical, biological, geological, chemical, and archaeological characteristics and boundaries of ocean and coastal areas, resources, and sea beds through the use of acoustics, satellites, aerial photogrammetry, light and imaging, direct sampling, and other mapping technologies.

Recent Mandates:

- Ocean and Coastal Mapping Integration Act, 2009
- Natl Ocean Policy Implementation Plan, 2013
- Administration/ Congressional Budgets

Why coordinate & collaborate on Data Acquisition?

- Avoid costly duplication of effort
- Maximize survey time
- Meet science & mission requirements

- IOCM:
  - Identifies mapped areas
  - Improves planning
  - Enables cross-agency collaboration, contracting
  - Can facilitate crowd-sourcing

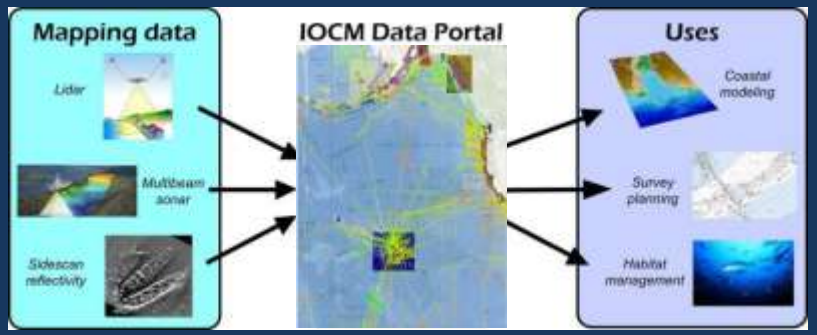
Why manage data?

- Enable OCM missions requiring scientific data
- Maximize use of data for multiple purposes
- Avoid costly data loss

- IOCM:
  - Ensures data collected are available for use
  - Processes data for multiple uses
  - Metadata, metadata, metadata

Why re-use data?

- Scientifically sound decisions require data
- Data are expensive to collect
- Scientific data management is cost-effective
  - 3-month study, 2000% return on investment



- IOCM:
  - Ensures data are available, accessible thru portals, archives
  - Enables use and re-use of data
  - Supports scientific and management missions

Opportunities

Maximizing Benefits of IOCM

Oceans, Coasts = Economy, Way of Life = Resilience

- Navigation, transportation, security
- Climate change and hazard resilience
- Scientific understanding
- Ecosystem-based management
- Environmental protection
- Energy siting and resource extraction
- Marine Planning

…Overlapping OCM data requirements

CMECS is

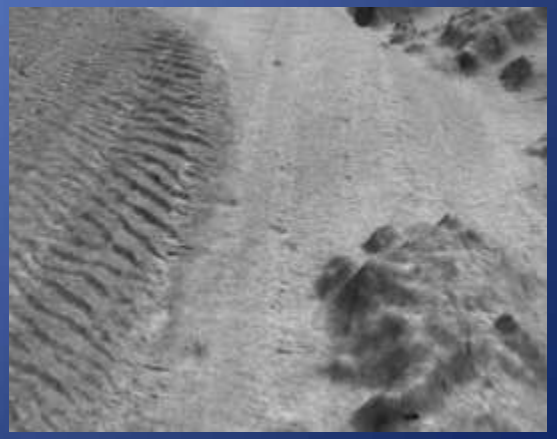
- The FGDC Standard for Coastal and Marine Ecological Classification (link)
- A unifying set of Nomenclatures and Data Structure that accommodates biological, geological, chemical, and physical data
- The addition of a minimum of one field of coding to your dataset



Why CMECS?

CMECS is the unifying scheme to catalog, inventory, and discover marine habitat data

- Currently over 100 systems used for classifying benthic habitats
- Few systems used by more than one party/advocate
- Most systems tied to a particular technology
- Most coastal/marine mapping done on a local or state level
- No existing marine or pelagic standard beyond Cowardin



National Coastal Mapping Strategy

Interagency Plan for Coordinated Mapping of Shoreline and the Littoral Zone

- **Version 1.0**
  - Builds on existing partnerships
  - High priority data need

FIVE Main Components:

- 8-year plan
- Annual Summit for coordination
- Common standards;
- Whole life cycle approach to data;
- R&D on new tool and techniques for data collection and use.

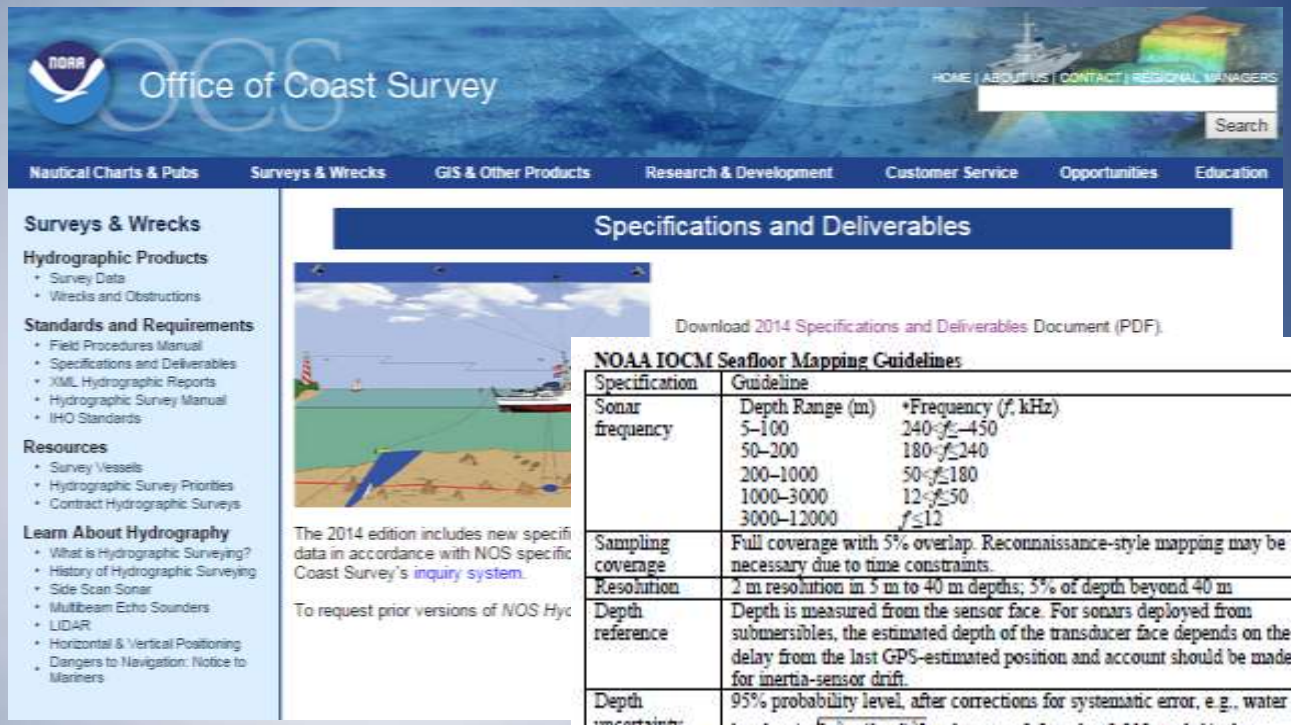
National Coastal Mapping Strategy

Component 2

Bathy Lidar Quality Level	Source	Vertical RMSE$_z$ (m)	Nominal Pulse Spacing (m)	Point Density (pt/m^2)	Corresponding 3DEP/topo-lidar QL
$QL1_B$	Bathy or Topo-Bathy Lidar	0.095 + 0.00275D	0.7	2.04	QL2 (note: D=0 for land)
$QL2_B$	Bathy or Topo-Bathy Lidar	0.095 + 0.00275D	2.0	0.25	No exact match
$QL3_B$	Bathy or Topo-Bathy Lidar	0.185 + 0.00275D	2.0	0.25	RMSE equivalent to QL3
$QL4_B$	Bathy or Topo-Bathy Lidar	0.185 + 0.00275D	5.0	0.04	RMSE equivalent to QL3; Point density equivalent to QL4 and QL5
$QL5_B$	Bathy or Topo-Bathy Lidar	0.463 + 0.00275D	5.0	0.04	Point density equivalent to QL4 and QL5

Hydro Data Acquisition Standards

- IOCM Seafloor Multibeam Standards
- NOAA Hydro-graphic Surveys Specs and Deliverables



NOAA IOCM Seafloor Mapping Guidelines

Specification	Guideline
Sonar frequency	Depth Range (m) *Frequency (f, kHz) 5–100 $240 \le f \le 450$ 50–200 $180 \le f \le 240$ 200–1000 $50 \le f \le 180$ 1000–3000 $12 \le f \le 50$ 3000–12000 $f \le 12$
Sampling coverage	Full coverage with 5% overlap. Reconnaissance-style mapping may be necessary due to time constraints.
Resolution	2 m resolution in 5 m to 40 m depths; 5% of depth beyond 40 m
Depth reference	Depth is measured from the sensor face. For sonars deployed from submersibles, the estimated depth of the transducer face depends on the delay from the last GPS-estimated position and account should be made for inertia-sensor drift.
Depth uncertainty	95% probability level, after corrections for systematic error, e.g., water level, $= \pm\sqrt{[a^2 + (b * d)^2]}$, where $a = 0.5$ m, $b = 0.013$, and d is the depth (= 0.5 m at 5 m depth, and = 2.6 m at 200 m depth)
Vertical Reference	Depths should be referenced to the appropriate Chart Datum (e.g., Mean Lower Low Water or Low Water Datum in non-tidal areas), or WGS 84 ellipsoid, and consider tide predictions, water level observations, datum references and zone corrections. The practical minimum for water level error is 0.20 m and allowable maximum is 0.45 m at the 95% confidence level. Coordinate, in advance of surveys, with the National Ocean Service's (NOS) Center for Operational Oceanographic Products and Services (CO-OPS), to prepare tidal zoning charts. This may require the installation of water level gauges or, in areas where water level gauges or shore-based kinematic GPS are not available, the installation of specialized GPS equipment on the survey vessel and subscription to specialized globally-corrected GPS (GcGPS) services. Platforms with inertial motion unit (IMU) systems should record the raw data input to the IMU.

Seasketch and Mapping Coordination

- Great visualization tool for understanding requirements, plans
  - Eg. NOAA/USGS/USACE and partners worked to maximize Sandy topobathy lidar data collects
  - USACE worked with USGS and WA stakeholders to discuss overlap requirements, modify plans for best outcome